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Indian Standard

VETERINARY THERMOMETERS, MERCURY-IN-GLASS TYPE — SPECIFICATION

ICS 11.040.55

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

March 2002

Price Group 2

Medical Instruments and Disposables Sectional Committee, MHD 12

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Medical Instruments and Disposables Sectional Committee had been approved by the Medical Equipment and Hospital Planning Division Council.

In the preparation of this standard, assistance has been derived from ASTM E667-97 'Standard specification for mercury-in-glass, maximum self — Registering clinical thermometers'.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS 2:1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

VETERINARY THEROMOMETERS, MERCURY-IN-GLASS TYPE — SPECIFICATION

1 SCOPE

This standard covers maximum self-registering, mercury-in-glass reusable thermometers used for measuring animal body temperatures.

2 REFERENCES

The following Indian Standard is necessary adjunct to this standard:

IS No.	*Title*
2627 : 1979	Glossary of terms relating to liquid-in-glass thermometers (*first revision*)

3 DEFINITIONS

3.0 For the purpose of this standard, the definitions given below, in addition to those given in IS 2627, shall apply.

3.1 Etch

To attack the surface of glass with hydrofluoric acid or other agent, generally for marking or decoration.

3.2 Reliability

The probability of performing without failure a specified function under normal conditions for a specified period of time.

3.3 Ceramic Marking

Marking by fusing a ceramic colorant onto the glass surface.

3.4 Fire Cracks

Cracks in glass caused by local temperature shock.

3.5 Flat Magnifying Lens

Thermometer stem glass in which the numerals, graduations, and lens lie on the same relative surface. It is so named for its approximately flat cross section (*see* Fig. 1).

3.6 Fractures

Internal or external breaks or cracks in the glass. Internal fractures usually occur in the area between the bulb and the constriction.

3.7 Hard Shaker Thermometer

A thermometer in which the constriction is overly severe thereby restricting the passage of mercury back to the bulb causing the thermometer to fail the ease-of-resetting requirements.

3.8 Magnifying Lens

Stem glass which, due to its configuration, results in a magnification of the mercury column.

3.9 Reflecting Stem

Stem glass containing a coloured strips along its length in a location which, when reflected on the mercury column allows greater contrast and enables the column to appear tinted.

3.10 Residual Mercury Column

The mercury that lies in the bore of the stem above the constriction.

3.11 Retreating Index Thermometer

A thermometer in which the constrictions is not sufficiently small to prevent the passage of mercury back to the bulb (or the mercury index from falling) without shaking when heat is removed from the bulb.

3.12 Triangular Magnifying Lens

Thermometer stem glass in which the numerals and graduations lie on surfaces that smoothly merge to form a lens. It is so named for its approximately triangular cross section (*see* Fig. 1).

4 TYPES

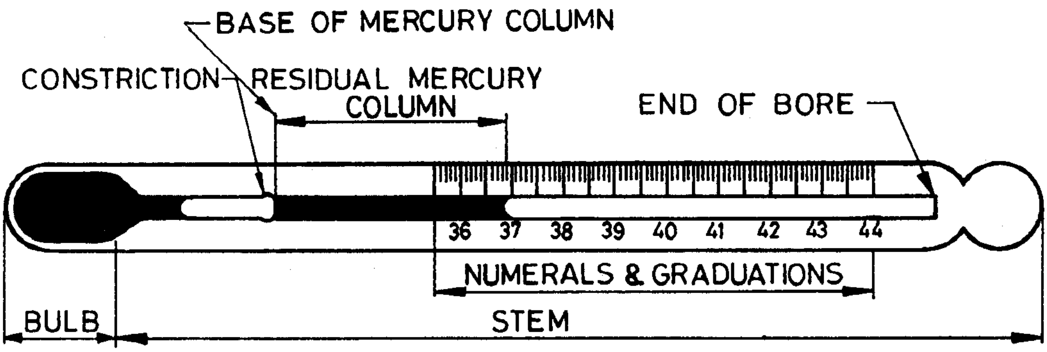
Veterinary thermometers shall be of the following types:

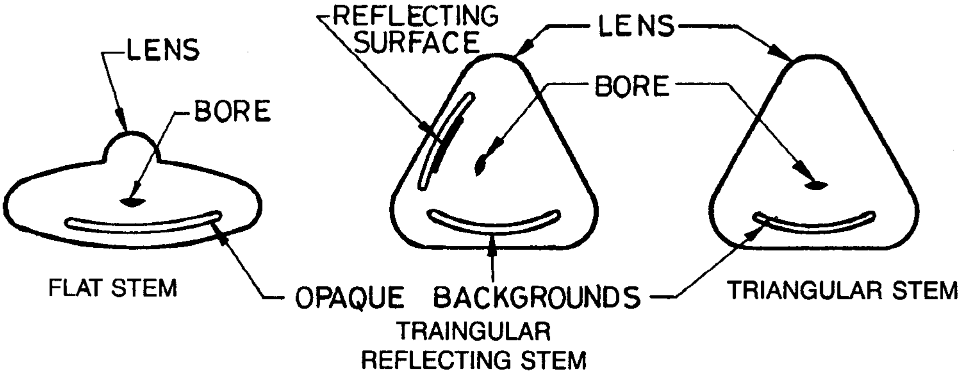
Type I	Ring top 100 mm, with Stubby bulb and regular scale type (at least 35.5 to 41°C)
Type II	Heavy duty ring top, 125 mm with stubby bulb and extended scale type (at least 35.5 to 44°C)

5 REQUIREMENTS

5.1 Glass

Thermometers shall be made from bulb glass and magnifying lens stem glass (glasses) having properties and characteristics that ensure stability, accuracy, and reliability in accordance with the requirements of this specification (*see* Annex A).





CROSS SECTION OF MAGNIFYING LENS STEMS

FIG. 1 COMPOSITE AND SECTION VIEWS OF VETERINARY THEROMOMETERS
(THESE SKETCHES FOR ILLUSTRATION ONLY)

5.2 Mercury

Mercury used in the thermometers shall have the purity, properties and characteristics that will enable the finished thermometers to comply with all the performance requirements of this specification. In addition, when finished thermometers are visually examined, the bulb and the mercury column shall be free of gas or other foreign material.

5.3 Length

The overall length of the thermometer shall not be less than 98 mm.

5.4 Thickness of Stem

No dimension of the cross section of flat magnifying stems shall be greater than 7.6 mm nor less than 3.6 mm. No dimensions of the cross section of triangular stems shall be less than 3.6 mm.

5.5 Scale Range and Position

There shall not be more than 5.0°C per 25.4 mm of temperature scale. The range of scale shall be at least from 35.5 to 41°C. The 35.5°C graduation mark shall not be less than 11 mm from the base of the mercury column. The 41°C mark shall be at least 3 mm from the end of the bore.

5.6 Graduations

The thermometers shall be graduated in 0.1°C intervals. All full-degree and half-degree graduations shall be long lines, and all other graduations shall be short lines. Appropriate numeral shall be placed at every full-degree graduation. If an arrow or other mark designating normal is used, the numeral at 37°C may be eliminated.

5.7 Legibility of Marks, Numbers and Graduations

All temperature scale graduations and numerals and all identification marks shall be made readily legible by the use of colorant. The cumulative absence of colorant from graduation lines shall not be more than the equivalent of one long graduation line, the cumulative absence of colorant from numbers shall not be more than the equivalent of one entire number, and the cumulative absence of colorant from letters shall not be more than the equivalent of one complete letter.

5.8 Permanency of Marks, Numbers and Graduations

When tested in accordance with **6.2**, all temperature scale graduations and numerals and all identification marks shall not fade or discolor in such a manner as to impair their legibility. The cumulative absence of colorant from graduation lines shall not be more than the equivalent of one long graduation line, the cumulative absence of colorant from numbers shall not be more than the equivalent of one entire number, and the cumulative absence of colorant from numbers shall not be more than the equivalent of one entire number, and the cumulative absence of colorant from letters shall not be more than the equivalent of one complete letter.

5.9 Stability

Thermometers shall be stabilized by natural or artificial means to assure that the requirements of this specification will be maintained by the thermometers while in normal use (*see* Annex A).

5.10 Accuracy

No individual reading on any thermometer shall be in error by more than the following in the ranges indicated:

Range, °C	*Maximum Error*, °C
Less than 35.8	0.3
35.8 to less than 37.0	0.2
37.0 to 39.0	0.1
Greater than 39.0 to 41.0	0.2
Greater than 41.0	0.3

Testing shall be in accordance with **6.3**.

5.11 Ease of Resetting

The length of the residual mercury column shall not exceed 20.6 mm and the top of the column shall fall below 35.5°C when tested in accordance with **6.4** (*see* description of hard shaker thermometer in **3.7**).

5.12 Temperature Retention

Each thermometer shall indicate 41.0 ± 0.2°C when tested in accordance with **6.5**. If applicable, as provided in **6.3**, the acceptable indication shall be 40.8 ± 0.2°C (*see* description of retreating index thermometer).

5.13 Workmanship

There shall be no constructional defects that would prevent the observations of temperature. The presence of unhealed fire cracks of fractures, when tested in accordance with **6.6**, shall be considered evidence of discreditable workmanship.

5.14 Fabrication

Thermometers designed for use in veterinary application shall meet the preceding requirements in **5.1** to **5.13** with the following exceptions.

5.14.1 *Type I Thermometer*

5.14.1.1 *Ring top*

Thermometers shall be constructed with a ring or loop at the end opposite to the bulb.

5.14.1.2 *Length*

The overall length of the thermometer shall not be more than 120 mm including the ring.

5.14.2 *Type II Thermometer*

5.14.2.1 *Ring top*

Thermometers shall be constructed with a ring or loop at the end opposite to the bulb.

5.14.2.2 *Length*

The overall length shall not be less than 125 mm nor more than 140 mm including the ring.

5.14.2.3 *Thickness of stem*

No dimension of the cross section of the stem shall be greater than 7 mm nor less than 5 mm.

5.14.2.4 *Scale range and position*

The range of scale shall be at least from 35.5 to 44°C. The 44°C mark shall be at least 3 mm from the end of the bore.

6 TESTS

6.1 General

The inspection and test procedures contained in this section are to be used to determine the conformance of thermometers to the requirements of this specification. Each producer or distributor who represents his products as conforming to this specification may utilize statistically based sampling plans that are appropriate for each particular manufacturing process, but shall keep such essential records as are necessary to document with a high degree of assurance his claim that all of the requirements of this specification are met. Additional sampling and testing of the product, as may be agreed upon between purchaser and seller, is not precluded but this section.

6.1.1 In all tests where a temperature-controlled bath is used, immerse all thermometers being tested to cover at least the bulb and the constriction.

6.2 Retention of Colorant

Immerse thermometers in an aqueous solution of 5% by weight phenol for a period of 1h at a temperature between 21 and 32°C.

6.3 Test thermometers for accuracy at the temperatures 37°, 39° and 41°C. Heat thermometers in a well-stirred temperature controlled bath, remove and read.

6.3.1 The test equipment shall include a constant-temperature water bath that is accurate to within ±0.03°C as verified by a system traceable to the International Practical Temperature Scale of 1990. The volume shall be a minimum of 1 l.

6.4 Ease of Resetting

After heating to 41 ± 0. 3°C centrifuge thermometers, bulb outward, to impart the equivalent centrifugal force of 51 ± 2 g at a point on the thermometer 33.9 mm from the end of the bulb. The centrifuging radius (from the center of rotation to 33.9 mm from the end of the bulb) shall be at least 127.0 mm.

6.5 Temperature Retention

Test regular-scale and extended-scale thermometers for accuracy at 41°C as described in **6.3**, but allow to cool slowly to 40.5°C or below at a uniform rate not exceeding 0.5°C in 3 min while still in the temperature-controlled bath. Remove the thermometers from the bath and read.

6.6 Fire Cracks

Inspect thermometers for the presence of fire cracks by examining them with the unaided eye.

ANNEX A

(*Clauses* 5.1 *and* 5.9)

GLASS INFORMATION

A-1 GENERAL

A-1.1 The required thermometer stability and reliability have been achieved using glasses with the following characteristics in conjunction with the following stabilization procedures. References to specific characteristics of glass or specific stabilization procedures are solely for the purpose of description. Any glasses or stabilization procedures, or both, may be used provided that they produce thermometers that will meet all of the requirements of this specification throughout their life.

A-2 STEM GLASS

A-2.1 Stem glass with a coefficient of expansion of $85 \pm 4 \times 10^{-7}$ °C^{-1}, a strain point of 418 ± 10°C, and an annealing point of 459 ± 10°C.

A-3 BULB GLASS

A-3.1 Bulb glass with a coefficient of expansion of $86 \pm 4 \times 10^{-7}$ °C^{-1}, a strain point of 494 ± 10°C and an annealing point of 533 ± 10°C.

A-3.2 Bulb glass with a coefficient of expansion of $9.3 \pm 4 \times 10^{-7}$ °C^{-1}, a strain point of 486 ± 10°C and an annealing point of 525 ± 10°C.

A-4 STABILIZATION PROCEDURES

Glass	*Natural*	*Artificial*
Stem glass **A-2.1** and Bulb glass **A-3.1**	4 month at room temperature	449 ± 5.6°C for at least 3 h. Cool to 260°C or below at a rate not exceeding 55°C/h.
Stem glass **A-2.1** and Bulb glass **A-3.2**	Not effective	433 ± 5.6°C for at least 2h. Cool to 260°C or below at a rate not exceeding 55°C/h.

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